

Intertidal Forage Fish Spawning Site Investigation for East Jefferson, Northwestern Kitsap, and North Mason Counties

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Introduction

The North Olympic Salmon Coalition (NOSC) conducted surveys for intertidal forage fish spawning sites for November 2001 to November 2004. The Washington Department of Fish and Wildlife (WDFW) had previously conducted the “Intertidal Baitfish Spawning Beach Survey Project” (IBSBSP) throughout Puget Sound from 1991-1999. This project supplied the only formal information on spawning locations of Pacific sand lance, *Ammodytes hexapterus*, and surf smelt, *Hypomesus pretiosus*, in Puget Sound. Despite WDFW’s efforts, many sampling gaps existed at the termination of their study. Many miles of beach in E. Jefferson County and surrounding areas hadn’t been studied. Shorelines included in the inventory had received minimal sampling and needed carefully planned follow-up sampling. Given the lack of knowledge regarding specific timing of forage fish spawning in a given area, and the obvious difficulty of finding 1mm opaque fish eggs in beach sand, repeated sampling is often necessary to find forage fish spawn sites (Moulton, Penttila 2001).

Nearshore areas of Puget Sound are subject to a variety of development impacts as human populations along our shores increase. Recognition and protection of spawning sites is critical to maintaining healthy forage fish populations. Once designated, forage fish spawning beaches are protected by the Washington Administrative Code “Hydraulic Code Rules” (WAC 220-110) through WDFW’s hydraulic permit application process. The first goal of the project was to document forage fish spawning beaches in E Jefferson County, N Mason County and NW Kitsap County and make this information available to WDFW.

A second, and complimentary, goal of the study was to involve and educate the public during the research. Contact with citizens at public outreach events made it clear that the general public had little to no understanding of what forage fish are, or why they are important. Once introduced, the topic generated enthusiastic interest and new understanding among volunteers, students, and landowners. Undoubtedly, improved understanding of forage fish and their habitat by shoreline landowners and public citizens is a critical part of their protection.

Methods

At the project’s outset, brochures explaining the importance of forage fish in a healthy marine environment, and the impacts of shoreline development on forage fish spawning were sent to every shoreline landowner in East Jefferson County. It asked for volunteer involvement and beach access to private beaches. The brochures were developed and written by biologist and author Ron Hirschi. A total of 124 positive responses, and 5 negative responses were received.

NOSC targeted spawning surveys in areas of sandy and pebbly beaches with limited previous spawning survey information. Spawning surveys use the Moulton-Penttila sampling protocols (2001). Habitat information collected at every sample site is entered in a standardized, GIS compatible spreadsheet provided by Friends of the San Juans and WDFW. NOSC’s database has been provided to WDFW for inclusion in WDFW’s Priority Habitat and Species (PHS) Database which is used by WDFW habitat managers in assessing and conditioning hydraulic permit applications.

At the conclusion of the study all E. Jefferson County shoreline landowners will be sent maps documenting the location of known forage fish spawning sites in their shoreline segment or bay. Drift cell imagery and bulkhead locations are included on the maps. An educational cover letter and map insets provide information about forage fish life histories, drift cells, bulkheads, and how these elements interact along local shorelines. A copy of the initial outreach brochure will be included.

Results

From September 2001 to November 2004 NOSC forage fish surveys collected 2115 samples. 179 samples, 8.5%, of collected samples, turned up multiple eggs of surf smelt and/or sand lance. These samples designated new spawning areas in 102 locations. 5.78 miles of new sand lance habitat and 10.84 miles of new surf smelt habitat has been designated in WDFW’s PHS database from NOSC sample stations. Approximately 12.02 miles of this habitat had no previous record of use by any forage fish species. On approximately 4.6 miles of beach, NOSC

found a second species of forage fish spawn in areas known by WDFW to be used by a different species of forage fish.

11 samples recorded multiple rock sole eggs, a demersal spawner known to use intertidal areas on occasion (Penttila, pers comm) but with no previous record of beach spawning in Jefferson County. NOSC rock sole samples designated 1.64 miles of rock sole spawning habitat in PHS. 3 samples recorded herring eggs. Herring eggs found on the beach are assumed to have detached from subtidal vegetation and are not included in PHS.

The table below provides a “bay by bay” summary of sampling results. “New Sites” are locations where no previous documentation of forage fish spawning existed 500 feet either side of the sample collection point. “Second Species” are sites where the beach was previously known to be used by one forage fish species, but a second species was encountered in samples from the site. “Redocumented sites” are locations where NOSC sampling found forage fish spawn on beaches known to be used by that species by WDFW. “One egg sites” are only noted in this report when they were encountered at sites previously unknown to be used by that species of forage fish. One egg sites are considered sites of interest, but are not designated as spawning grounds in PHS.

| Shoreline Region | Miles (approx) | # of Samples | New Sites | Second Species | Redocumented sites | One egg sites |
|-------------------------|----------------|--------------|-----------|----------------|--------------------|---------------|
| Discovery Bay | 21.9 | 200 | 4 | 0 | 2 | 3 |
| N Quimper Peninsula | 4.1 | 91 | 0 | 0 | 1 | 0 |
| Port Townsend Bay west | 11.7 | 253 | 9 | 0 | 8 | 4 |
| Indian Island | 11.7 | 140 | 12 | 13 | 26 | 6 |
| Marrowstone Island | 17.4 | 232 | 4 | 6 | 11 | 2 |
| Oak Bay | 5.6 | 73 | 2 | 0 | 0 | 0 |
| Port Ludlow | 14.6 | 173 | 13 | 1 | 12 | 4 |
| Squamish Harbor | 6.4 | 62 | 1 | 0 | 2 | 3 |
| Thorndyke Bay | 4.1 | 79 | 0 | 0 | 1 | 3 |
| E. Coyle Peninsula | 10.2 | 110 | 1 | 1 | 2 | 3 |
| Dabob Bay | 20.0 | 220 | 20 | 7 | 6 | 3 |
| Quilcene Bay | 10.2 | 59 | 4 | 1 | 9 | 1 |
| Pulali Pt to Quatsap Pt | 9.9 | 82 | 4 | 0 | 0 | 1 |
| Quatsap Pt to Liliwaup | 19.5 | 88 | 0 | 0 | 0 | 0 |
| Pt No Pt to Coon Bay | 8.2 | 68 | 0 | 0 | 0 | 3 |
| Salsbury Pt to Bangor | 8.5 | 135 | 1 | 0 | 0 | 2 |
| Bangor to Seabeck | 9.8 | 95 | 2 | 0 | 2 | 1 |
| | | | 73 | 29 | 80 | 39 |

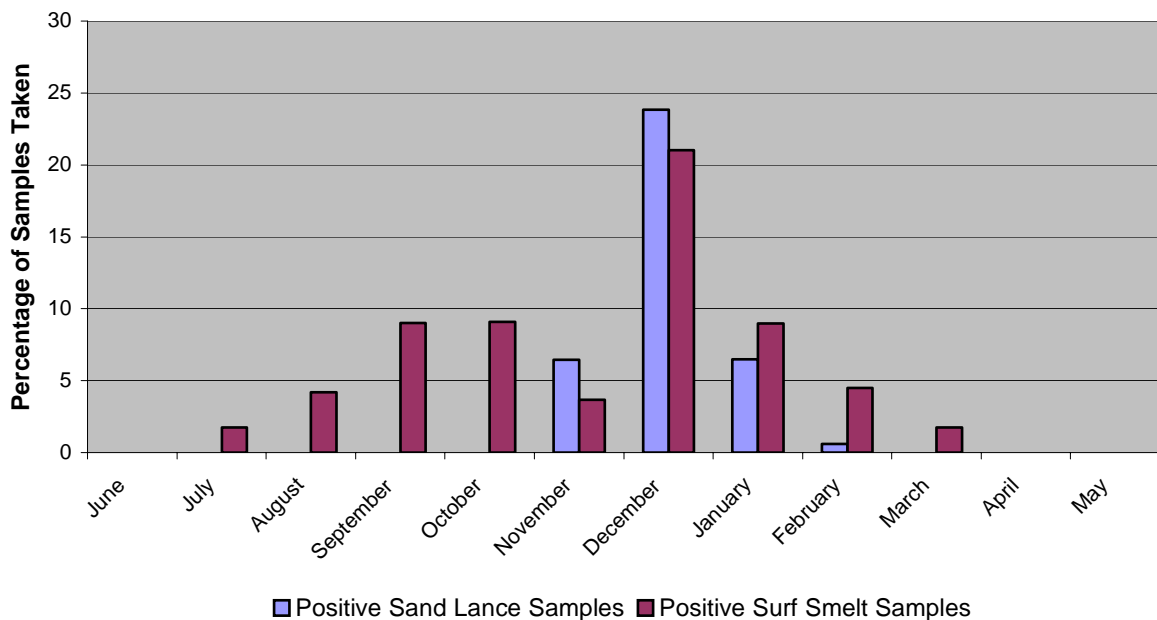
One Egg Sites

39 one egg samples were collected by NOSC in areas previously unknown to support spawning of the detected species. These and historic one egg sites are areas for the concentration of future study (Penttila, 2000). During NOSC’s sampling efforts, sampling at historic WDFW one egg sites often resulted in the confirmation of the beach as a spawning site by the species detected by WDFW or by a second species of forage fish.

| WDFW One Egg Sites in E JeffCo | Original species usage confirmed by NOSC resampling | Alternate species usage confirmed by NOSC resampling | Percentage one egg sites confirmed as spawning grounds |
|--------------------------------|---|--|--|
| 25 | 6 | 5 | 44% |

Spawning Timing

Any sample with one or more eggs detected was classified by the month in which it was collected to demonstrate months in which spawn is most likely to be collected in the study area. No samples were collected in April, May or June.



Discussion

In order to most completely locate forage fish spawning areas, sampling needs to take place over several seasons in several different months. Even then, it is very likely that spawn events will be missed, and beaches used by forage fish will remain undocumented. We believe that undetected spawning sites exist throughout the study area.

Future success of spawning surveys would be greatly enhanced by the inclusion of protocols for monthly sampling in areas where no spawning is currently designated, but seems probable based on habitat conditions or the previous detection of 1 forage fish egg. Such intensive monitoring may be accomplished with local citizens assigned beach reaches that receive monthly sampling over a course of 3-5 years. This citizen science project could be effectively implemented by Regional Fisheries Enhancement Groups and Marine Resource Committees.

The protection of Puget Sound's nearshore areas is vital to continued reproductive success of these beach spawners. Current regulations concentrate on the protection of known forage fish spawning grounds. Such regulations miss addressing indirect effects on spawning grounds by shoreline activities or modifications up drift or down drift of known spawn sites. Additionally, these regulations have no way to consider shifts in habitat utilization by forage fish stocks or the fact that many beaches support forage fish spawning, but are currently undocumented.

This project serves as an excellent example of citizen science creating usable data for direct use by resource managers. Not only was a vast amount of information generated that will be useful to planners for decades to come, but because the public was allowed to actively participate and learn while conducting the work an immeasurable amount of protection of forage fish resources was accomplished through public awareness. Experiences on the beach with project volunteers and shoreline landowners and at outreach events with the general public, demonstrate that once people know about forage fish, most show immediate interest and concern for the fish. Citizens voiced concerns ranging from whether they should be walking on the beach during spawning seasons, to concerns about the affects of their own or their neighbors bulkheads/docks/groins, and citizens concerned with removal of marine riparian vegetation.

Education efforts concerning bulkheading and drift cells was also met with child like curiosity and gee whiz reactions. Most citizens and shoreline landowners contacted had little to no understanding of what bulkheads might do to a beach or that beaches are “rivers of sand”, constantly changing and in motion. The concepts are simple enough, that once explained, they realize an immediate impact on ones perception of a beach or a bulkhead. Beach walks just aren’t the same once shoreline processes and forage fish spawning are explained to the beach walkers.

Increased awareness of the presence, importance, and needs of forage fish among shoreline landowners and the general public encourages improved stewardship of Puget Sound shores. Stewardship paired with adequate regulations regarding this resource provides the best assurance that forage fish stocks will continue to find ample spawning beaches in their historic locations.

Bibliography:

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